

10/535080

JC13 PCT/PTO 13 MAY 2005

Our Docket No.: 51876P854
Express Mail No.: EV372842281US

UTILITY APPLICATION FOR UNITED STATES PATENT

FOR

Apparatus and Method for Searching AP of Wireless Lan Based on Broadcasting Information of Base Station in
Mobile Communication System

Inventor(s):

Jin Kyeong Kim
Nam Hoon Park
Dae Sik Kim

Blakely, Sokoloff, Taylor & Zafman LLP
12400 Wilshire Boulevard, 7th Floor
Los Angeles, CA 90025
Telephone: (310) 207-3800

APPARATUS AND METHOD FOR SEARCHING AP OF WIRELESS LAN BASED
ON BROADCASTING INFORMATION OF BASE STATION IN MOBILE
COMMUNICATION SYSTEM

5 Technical Field

The present invention relates to an apparatus for automatically searching a wireless local area network (LAN) access point by using broadcast information and method
10 thereof.

Background Arts

A wireless LAN technology is a technology handling
15 operations for accessing to a wired LAN through an air based on IEEE 802.3. The wireless LAN technology includes various technologies such as IEEE 802.11, IEEE 802.11b, IEEE 802.11a and IEEE 802.11g as standards. Recently, a direct sequence mode and CCK mode of wireless LAN according
20 to IEEE 802.11b has been popular.

The wireless LAN is cooperated with a wired LAN according to various operation types such as a Bridge mode operation type for cooperating between the wireless LAN and the wired LAN by simply expanding a wired LAN to a wireless
25 region. Furthermore, the wireless LAN is cooperated with the wired LAN by implementing additional protocols for authenticating of mobile stations, and receiving a public Internet Protocol IP address from a network and allocating private IP address to a mobile station in a Dynamic Host
30 Configuration Protocol (DHCP) client and server function.

An access point (AP) is a station having a wireless LAN relay function for accessing to mobile stations e.g., a personal data assistance and a notebook computer through the wireless LAN, and a wired LAN Hub functions by
35 equipping a wired ports in the AP for accessing a printer and desktop personal computer through the wired LAN.

In a case of wireless LAN, a wireless communication

is permitted to mobile stations that have been previously authenticated by registering a MAC ID of a network interface card (NIC) in the mobile station at a wireless LAN access point. Accordingly, a mobile station having
5 unregistered MAC ID cannot access to the wireless LAN through a wireless LAN AP. The above mentioned management function is included in the wireless LAN AP for selectively using the management function. Furthermore, the wireless LAN AP having the management function can be controlled by
10 using a browsing window of Internet explorer as a WEB mode. Therefore, a user can simply control various function of the wireless LAN AP.

Recently, a wireless communication service provider provides a data service through a mobile communication
15 module based on IS-95 or 3G. However, the wireless communication services are not popular because a service fee is very expensive and data transmission speed is too slow. For overcoming such a disadvantage, a wireless LAN module is additionally equipped in a mobile station for
20 receiving the data service in low price and high speed in an area where the wireless LAN AP is located by using the wireless LAN module instead of using the mobile communication module.

For determining whether or not there is an active
25 wireless LAN access points existed, the wireless LAN module must search a beacon signal transmitted from the active wireless LAN AP. In a case of finding the beacon signal, the mobile station can have data service through corresponding wireless LAN AP. The wireless LAN AP has a
30 limitation to provide data service within its service area. Therefore, the mobile station located out of the service area of the wireless LAN AP must use the mobile communication module to receive the data service.

As mentioned above, the mobile station having both
35 the mobile communication module and the wireless LAN module must continuously search a beacon signal for finding the wireless LAN AP. On the other hand, the wireless LAN AP is

not installed in everywhere. The wireless LAN AP is only installed in a place where many users of wireless data service frequently get together. Therefore, in a location of no wireless LAN AP installed, the mobile station having
5 wireless LAN module wastes an electric power to search the beacon signal.

For eliminating the above problem, the user can manually control to start and stop to search the beacon signal according to user's decision. However, it makes the
10 user inconvenient.

Accordingly, the users have been demanding a method for automatically searching the beacon signal without considering high power consumption problem in a case that a user of the mobile station having both the mobile
15 communication module and the wireless LAN module wants to receives wireless data service through the wireless LAN AP.

Disclosure of the Invention

20 It is, therefore, an object of the present invention to provide an apparatus for automatically searching a wireless LAN access point based on broadcast information of a base station in order to prevent high power consumption by operating a wireless LAN module in only case that a
25 mobile station is located within a service area of a wireless LAN access point, and method thereof.

In accordance with an aspect of the present invention, there is provided an apparatus for searching an access point of a mobile terminal, the apparatus includes: a
30 wireless LAN service determination unit for determining whether or not there is an access point of wireless LAN providing wireless data service based on broadcasting information transmitted within a service area of a base station; and a wireless LAN service unit for searching a
35 beacon signal transmitted from the access point of the wireless LAN according to the determination result of the wireless LAN service determination unit and receiving

wireless data service from the access point of the wireless LAN based on the beacon signal.

In accordance with an aspect of the present invention, there is also provided a method, being implemented to a wireless LAN access point searching apparatus, for searching an access point, the method including the steps of: a) obtaining broadcasting information, provided within a service area of a base station, by a mobile communication module of a mobile station; b) determining whether or not there is the wireless LAN access point providing services based on the obtained broadcasting information; and c) receiving wireless data service from the wireless LAN access point by using a wireless LAN module which searches periodically transmitted beacon signal of the wireless LAN access point in case there is the wireless LAN access point is existed .

In accordance with an aspect of the present invention, there is provided a computer readable recoding medium having executable instructions for implementing a method for searching an access point, the method including the steps of: a) obtaining broadcasting information, provided within a service area of a base station, by a mobile communication module of a mobile station; b) determining whether or not there is the wireless LAN access point providing services based on the obtained broadcasting information; and c) receiving wireless data service from the wireless LAN access point by using a wireless LAN module which searches periodically transmitted beacon signal of the wireless LAN access point in case there is the wireless LAN access point is existed .

Brief Description of the Drawings

The above and other objects and features of the present invention will become apparent from the following description of the preferred embodiments given in conjunction with the accompanying drawings, in which:

Fig. 1 is a conceptual view illustrating conventional steps of searching a beacon signal of a wireless LAN access point AP;

Fig. 2 is a diagram showing an apparatus for automatically searching a wireless access point by using broadcast information of a base station in accordance with a preferred embodiment of the present invention;

Fig. 3 is a conceptual view for explaining a method for automatic searching a wireless LAN access point AP by using broadcast information of a base station in accordance with a preferred embodiment of the present invention;

Fig. 4 is a structure of broadcast information transmitted from a base station in accordance with a preferred embodiment of the present invention; and

Fig. 5A and 5B is a view for explaining steps for arranging base stations for improving efficiency of a method automatically searching a wireless LAN access point in accordance with a preferred embodiment of the present invention.

Modes for carrying out the Invention

Other objects and aspects of the invention will become apparent from the following description of the embodiments with reference to the accompanying drawings, which is set forth hereinafter.

Fig. 1 is a conceptual view illustrating conventional steps of searching a beacon signal of a wireless LAN access point AP. Fig. 1 shows that conventional steps for continually searching the beacon signal of the wireless LAN access point AP while the mobile station MS having a wireless LAN module is moving around.

As shown, the mobile station MS 11 must reach a service area of the wireless LAN access point AP 13 through paths 12 for receiving wireless data service transmitted from the wireless LAN access point 13. That is, the MS 11 must reach the service area 14 of the access point 13 in

which the MS 11 can find a beacon signal.

Fig. 2 is a diagram illustrating an apparatus for automatically searching a wireless access point by using broadcast information of a base station in accordance with a preferred embodiment of the present invention.

As shown, the apparatus for automatically searching a wireless access point includes a mobile communication module 22 and a wireless LAN module 21. The mobile communication module is used for determining whether or not there is a wireless LAN access point transmitting wireless data services based on the broadcast information transmitted within a service area of the base station. The wireless LAN module is used for receiving the wireless data service through the wireless LAN access point by searching the beacon signal transmitted from near wireless LAN access point according to the determination result of the mobile communication module 22.

The mobile station MS 11 of the present invention includes both the wireless LAN module 21 and the mobile communication module 22 and various kind of mobile stations can be used as the mobile station MS 11 of the present invention such as a cellular phone, a PCS phone, a next generation terminal capable of processing in international mobile telecommunication IMT 2000 and universal mobile telecommunication service, and personal digital assistants.

The wireless LAN module 21 performs a wireless LAN accessing function e.g., IEEE 802.11b/a and the mobile communication module 22 performs a determination function by receiving the broadcast information from the base station, determining whether or not presence of wireless LAN AP and providing determination result to the MS 11.

Fig. 3 is a conceptual view for explaining a method for automatic searching a wireless LAN access point AP by using broadcast information of a base station in accordance with a preferred embodiment of the present invention.

If a mobile station MS 11 is located within a service area of a base station 31, the MS 11 receives the broadcast

information by using a mobile communication module 22 and determines whether or not there is the wireless LAN access point transmitting wireless data service.

5 In case of Fig. 3, there is not the access point within the service area of the base station 31 and the MS 11 does not search the wireless LAN AP by the wireless LAN module 21.

10 If the MS 11 enters a service area of base station 32, broadcast information of the base station 32 is received by using the mobile communication module 22. After receiving the broadcast information, the MS 11 determines whether or not there is wireless LAN AP based on the broadcast information. Since there are the wireless LAN APs 33 and 34, the MS 11 starts to search a beacon signal periodically
15 transmitted from the wireless AP 33 and 34 by using the wireless LAN module. If the MS 11 finds the beacon signal from AP 33 and 34, the MS 11 receives wireless data service transmitted from the AP 33 and 34.

20 Fig. 4 is a structure of broadcast information transmitted from a base station in accordance with a preferred embodiment of the present invention.

The base station additionally inserts information indicating presence of wireless LAN access point AP in to conventional broadcast information for noticing presence of
25 the wireless LAN access point AP to the MS 11. The broadcast information is periodically broadcasted to all MS 11 entering the service area of the base station.

30 Fig. 5A and 5B is a view for explaining steps for arranging base stations for automatically searching a wireless LAN access point in accordance with a preferred embodiment of the present invention. It is an example of arrangement of base station to improving efficiency of the present invention.

35 As shown in Fig. 5A, a base station 51 has comparatively wide service area and includes two wireless LAN access points 53 and 54. Accordingly, a mobile station 11 receiving broadcast information from the base station 51

must search wide service area of the base station 51 for finding the wireless LAN access points 53 and 54. Therefore, it is possible to fail for finding the wireless LAN access points 53 and 54 and a wireless LAN module 21 of the mobile station 51 must use large amount of power to search the wireless LAN access points. It is not effective method for finding the wireless LAN access points in such a wide service area.

As shown in Fig. 5B, base stations 55 and 56 are individually installed based on a service area of the wireless LAN access points 53 and 54 by setting a comparative small service area into the base stations 55 and 56 in order to improve efficiency of the present invention. That is, the mobile station 11 search a service area 57 of the base station 56 which is smaller comparing to the service area 52 of the base station 51 in case that the mobile station 51 is located within the service area of the base station 56 by individually installing the base station 55 for the wireless LAN access point 53 and installing the base station 56 for the wireless LAN access point 54. As a result, the mobile station 11 uses less power to find the wireless LAN access point comparing a case of Fig. 5A.

As mentioned above, the present invention can be implemented as computer executable instructions and can be stored in a computer readable recoding medium such as a CD-ROM, RAM, ROM, floppy disk, hard disk and optical magnetic disk.

As mentioned above, the present invention determines presence of wireless LAN access point based on broadcast information provided from a base station by using a mobile communication module and tries to receive wireless LAN services when there is the wireless LAN access point existed. Therefore, the present invention can eliminate high power consumption problem wasted by the wireless LAN module for frequently searching the wireless LAN access point. Furthermore, a method for automatically searching

the wireless LAN access point can be provided without considering high power consumption problem by the present invention.

While the present invention has been described with
5 respect to certain preferred embodiments, it will be apparent to those skilled in the art that various changes and modifications may be made without departing from the scope of the invention as defined in the following claims.